

WHAT IS CLAIMED IS:

1. An apparatus for processing a substrate, comprising:
a chamber having a first electrode disposed therein;
a substrate support disposed in the chamber and providing a second electrode in the chamber;
a high frequency power source electrically connected to either the first or second electrode;
a low frequency power source electrically connected to either the first or second electrode; and
one or more variable impedance elements connected to the first and/or second electrode between the substrate support and an electrical ground.
2. The apparatus of claim 1, wherein the first electrode comprises a gas distributor.
3. The apparatus of claim 1, wherein the first electrode and the second electrode form parallel plate electrodes.
4. The apparatus of claim 1, wherein the chamber is configured as an etch chamber.
5. The apparatus of claim 1, wherein the high frequency power source is adapted to deliver power between about 13.56 MHz and about 500 MHz.
6. The apparatus of claim 1, wherein the low frequency power source is adapted to deliver power between about 100 kHz and about 20 MHz.
7. The apparatus of claim 1, wherein the variable impedance elements comprise at least one inductor and at least one capacitor.
8. The apparatus of claim 1, wherein the variable impedance elements comprise at least one inductor and at least one variable capacitor.

9. The apparatus of claim 1, wherein the variable impedance elements are adapted to tune a self bias voltage division between the first and second electrodes.
10. The apparatus of claim 1, wherein the variable impedance elements are adapted to tune at least one resonant impedance at a frequency selected from at least one of the low frequency and the high frequency.
11. The apparatus of claim 1, wherein the variable impedance elements are adapted to tune a first resonant impedance at the low frequency and a second resonant impedance at the high frequency.
12. The apparatus of claim 11 wherein the high frequency power and the low frequency power are delivered to one electrode and at least one variable impedance element is connected to the other electrode.
13. The apparatus of claim 11 wherein the high and low frequency power are delivered to opposite electrodes and a variable impedance element is connected to each electrode.
14. An apparatus for delivering power to a process chamber having a first electrode and a substrate support forming a second electrode, comprising:
 - a high frequency power source electrically connected to the first electrode;
 - a low frequency power source electrically connected to the first electrode; and
 - a variable impedance element connected between the substrate support and an electrical ground.
15. The apparatus of claim 14, wherein the high frequency power source is adapted to deliver power between about 13.56 MHz and about 500 MHz.
16. The apparatus of claim 14, wherein the low frequency power source is adapted to deliver power between about 100 kHz and about 4 MHz.
17. The apparatus of claim 14, wherein the variable impedance element comprises at least one inductor and at least one capacitor.

18. The apparatus of claim 14, wherein the variable impedance element comprises at least one inductor and at least one variable capacitor.

19. The apparatus of claim 14, wherein the variable impedance element is adapted to tune a self bias voltage division between the first electrode and the substrate support.

20. The apparatus of claim 14, wherein the variable impedance element is adapted to tune at least one resonant impedance at a frequency selected from at least one of the low frequency and the high frequency.

21. The apparatus of claim 14, wherein the variable impedance element is adapted to tune a first resonant impedance at the low frequency and a second resonant impedance at the high frequency.

22. The apparatus of claim 14, wherein the first electrode comprises a gas distributor.

23. The apparatus of claim 14, wherein the first electrode and the substrate support are disposed to form parallel plate electrodes.

24. The apparatus of claim 14, wherein the chamber is configured as an etch chamber.

25. A method for delivering power to a process chamber having a first electrode and a substrate support forming a second electrode, comprising:

delivering a high frequency power from a high frequency power source electrically connected to one of the electrodes;

delivering a low frequency power source from a low frequency power source electrically connected to one of the electrodes; and

connecting one or more variable impedance elements to one or more of the electrodes and an electrical ground.

26. The method of claim 25, wherein the high frequency power is between about 13.56 MHz and about 500 MHz.
27. The method of claim 25, wherein the low frequency power is between about 100 kHz and about 20 MHz.
28. The method of claim 25, further comprising:
tuning the one or more variable impedance elements to control a self bias voltage division between the first electrode and the second electrode.
29. The method of claim 25, further comprising:
tuning the one or more variable impedance elements to provide at least one resonant impedance at a frequency selected from at least one of the low frequency and the high frequency.
30. The method of claim 25, further comprising:
tuning the one or more variable impedance elements to provide a first resonant impedance at the low frequency and a second resonant impedance at the high frequency.
31. The method of claim 25, further comprising:
distributing a processing gas from the first electrode.
32. The method of claim 25, wherein the first electrode and the substrate support are disposed to form parallel plate electrodes.
33. The method of claim 25, wherein the process chamber is configured to perform an etch process.